The Northwestern MILLER

MILLING PRODUCTION SECTION

Diversified Program Presented at 1955 AOM Conference

By Paul L. Dittemore and George E. Swarbreck

Northwestern Miller Editorial Staff

A diversified program, covering the whole theory and practice of flour milling, was presented at the 1955 technical conference of the Association of Operative Millers in St. Louis.

Many subjects were discussed, from personnel handling to various processes involved in mill operations.

Summaries of the technical conference papers follow:

Selection of Personnel

A series of related addresses dealing with personnel, safety and maintenance constituted the program for the opening session of the conference. Moderator for the session was George S. O. Smith, Flour Mills of America, Inc. Prof. George Elliot, Dept. of Mechanical Engineering, University of Missouri, Columbia, in his address "Selection of Personnel" said that there are three fairly important reasons why the selection of an employee is more important today than it was ten years ago. He listed these as being first, the increasing technical know-how needed; second, union seniority rules; and third, the increase in technical ability needed because of the larger use of technical equipment. Mr. Elliot said that managements are realizing that they need more of the young people and they are also realizing that they "have something to offer some of the more intelligent of the working force."

Mr. Elliot followed this with the discussion of the five generally accepted methods of finding out more about applicants for jobs and said that these include the written application, the personal interview, checking of the individual's references, psychological tests, and physical examinations.

Of the benefits of testing applicants for employment is that a good foreman is not always a good operator, or that a good operator will not always make a good foreman. He pointed out that industry has been promoting for years and years the idea that a good operator should also be a good foreman.

"But very often the characteristics that are necessary for those two jobs are entirely different," Mr. Elliot said, "and after a testing program has been established, those facts come to light." He said that it is a "crime" to promote an outstanding operator to be a foreman, have him be a poor foreman, have him fail as foreman because he may be lost as a worker, too. He said that the man's ego, his status will not let him return to the job of operator after he has held a foreman's position.

In closing, Mr. Elliot said to the Superintendents: "So you are what your people make you. If you start out with poor people, they will make you a poor supervisor. So, in the field of supervision, the selection of your employees is the first of many important tasks."

Training and Promotion

James H. Burrell, President of James H. Burrell & Sons, Inc., St. Louis, followed Mr. Elliot's discussion of methods of selecting personnel with a discussion of "training and promoting personnel."

He pointed out, as did Mr. Elliot, that the "success of any business depends to a major degree on the selection and training of people."

Mr. Burrell said that it is generally recognized that there are two types of managers—one who is highly successful, and the other who "just gets by." He said there are several basic rules which may be used to stimulate employees and management; these include first, the establishment of clear-cut objectives; second, provision of a step-by-step program to reach those objectives; third, selling the program of the company to all the people within the organization; planning ahead for others and making long-range plans for management; teaching people how to manage, as well as what and when to manage; and, finally, the teaching of employees the proper respect of their department managers.

Mr. Burrell also re-emphasized a point made by Mr. Elliot in his talk when he said that "sometimes an excellent salesman is ruined by promoting him to a sales managing position, only to learn later that you lost an excellent salesman, but did not gain a manager. This man cannot be demoted without serious embarrassment, so he is discharged." Mr. Burrell added that in most cases this "unfortunate victim" will be embittered for life because of his experience.

The management counsellor told the operatives that the application of human relations will solve many of our problems of today and pave the way for greater accomplishments for all of us. "You and I must take time from our own pleasures to study and to make use of our abilities.

Directing Personnel

The third address dealing with personnel selection and training was presented by C. A. Tolin, production manager of the central division, Ralston Purina Company, St. Louis. Mr. Tolin concerned himself with the direction of personnel, and his address was a "repeat" of the address he made last winter at the Midwest Feed Manufacturers Production School in Kansas City.

Mr. Tolin said that the effectiveness of directing personnel is quickly measured at any time by the results "we are getting in a business." He added that management is up against a very real problem in "knowing they could do better, but they fear the uncertainty of change and it does take a lot of effort to improve things." Among the many points Mr. Tolin developed in detail were these generalizations: a close relationship between management and employees built on confidence and faith is the result of day-by-day direction with a purpose; fear or force may compel a man to accept direction, but experience has shown that direction is really not accepted unless the man being directed responds to that direction; in directing personnel one must consistently think of the person who is going to carry out the orders; when the leader remembers that he is dealing with human beings who respond to selling a good treatment he is more concerned about the down-deep feelings of the person involved than what appears on the surface.

Mr. Tolin said that the biggest job facing management is to "develop the spirit in people to the point where they are eager to accept delegation of responsibility or authority." He added that the most difficult thing to do in effective direction is to take the "old school" type of management man and make him realize that there is more to giving directions than just giving an order.

Safety and Your Future

"Safety and your future in the milling industry," was the title of the fourth of the series on personnel and management, presented by G. E. Thiel, safety manager of the Bendix Aviation Corp. Mr. Thiel said that perhaps a sub-title for his address could be "How Does Safety Enter the Cost Picture?" He pointed out that business and industry are interested in accident prevention because all business is organized for profit and accidents are costly and reduce profits. Mr. Tolin recommended that a safety program be incorporated in all plants as an integral part of the overall operations on equal footing with the quality and quantity control in a plant. He said there is just one job in all three elements—quality, quantity and accident prevention must be combined to produce."

Mr. Kiel outlined the saparate steps in the establishment and maintenance of safety programs in plants and said that employees must not be left to see unsafe practices themselves but must have unsafe practices, careless operations and other causes of accidents pointed out to them and all persons in the plant from the management personnel on down must constantly be on the look-out to avoid accidents.

He said that "just because you have not had a serious lost-time accident is no reason to forget accident prevention, but that is just the time you should try to prevent the one that might happen." The recitation of the safety records of different plants was incorporated as a part of Mr. Tolin's address, and he pointed out that accidents do have an effect on the cost picture in any plant.

He concluded by saying that all injuries are not preventable, but most injuries can be prevented. He said that he believed if each superintendent concentrated on preventing injuries by careful planning, thorough training and plant inspection for hazards, "you would greatly reduce injuries and increase your production."

Preventive Maintenance

The concluding paper on the symposium on personnel safety and maintenance was presented by Harold M. Weis, a member of the engineering and construction planning department of the Quaker Oats Co., Chicago. Mr. Weis said that a preventive maintenance program includes first, a method of recording the unit maintenance cost of each piece of machinery; second, a method of advising operators of time to inspect machinery units; and third, a method of reporting the results of the program to management.

The speaker said that printed forms can be devised to satisfy all three requirements of the program. They consist of a unit record card, an inspection date card, and an inspection order.

Mr. Weis said that preventive

(Continued on page 4a)

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The Old and the New Blended To Make Country Milling Pay

By Henry S. French

EDITOR'S NOTE: The busy milling executive, working under pressure; the sales manager, striving for more business; the export manager bogged down in a mass of rules and regulations in his overseas markets, indeed, everybody connected with the hectic business of selling flour and feed must sigh for the peaceful life of the country miller. Many say they would like to retire to such an establishment and, like Old Dad Fetchit of the Fish River Roller Mills, take time out for fishing. Such a mill is described in this story. Mr. French is a member of The Northwestern Miller's editorial staff. He stresses that there is a lot of hard work involved; but he also mentions fishing.

In December, 1954, the Rinkel family celebrated the golden anniversary of its ownership of the Greenfield Mills, near Howe, Ind. The occasion was marked by the start of a face-lifting operation to alter and beautify the appearance of the mill, which was built in 1836.

There are four generations of Rinkels associated with the mill today; some fully operational, others up-and-coming. There is Mrs. Henry G. Rinkel, 75 year old widow of the founder of the present firm. There is the son of the first owner, now head of the mill at the age of 56, George Rinkel. He is assisted by his son Howard G. Rinkel, 27, who has, in turn, two youngsters, Hal George, 4, and Danny, 2.

FAMILY MILL—Four generations of the Rinkel family are represented in this picture. Left to right, at the back, are Howard G. Rinkel; Mrs. Henry G. Rinkel, 75-year-old widow of the first Rinkel to own the mill, and George Rinkel, son. In the front row, left to right, are Daniel G. Rinkel, aged 2, and Hal George Rinkel, aged 4, both sons of Howard.

The capacity of the mill is 80 sacks flour, basis 24-hour working. It is an all-family flour operation, with deliveries direct to grocery stores. The flour is sacked into two, five, 10 and 25 lb. sacks. In addition to the wheat flour, also offered to grocers are self-rising pancake flour, pure buckwheat flour, self-rising buckwheat pancake mix and graham flour. The trade mark for these products is "New Rinkel."

Secret of Survival

Asked how such a small operation could survive in the face of extreme competition, and reminded that most such mills had fallen by the wayside, George Rinkel made a remark which might well be considered as advice to small businessmen everywhere.

"The small mills died," he said, "because they placed no emphasis on sales and had no sales organization. We have been able to stay in business because we always have believed in sales effort, especially the personal kind. We try to meet as many people as possible and believe in the power of publicity. We cut corners by having a three-in-one man. My son Howard delivers, sells and collects, all at the same time. We give no credit and sell only to a few bakery accounts that are well-established and known."

Mr. Rinkel does some custom grinding of feeds, and sells his millfeeds mostly at retail. Adjacent to the mill are two concrete silos, with a capacity of 4,000 bu. of grain each. The mill capacity of grain is 6,000 bu.

One reason for the survival of the business, Mr. Rinkel believes, is the low-pressure life of the family. Both father and son are ardent fishermen.

The mill is electrically driven by a hydro-electric power plant, which was put in in 1925. The water power comes from the Fawn River, on which the mill is built. The power plant generates 100 kilowatts of electricity, which furnishes electricity for 11 units in all, including the mill, the homes of the family and others in the area, and the local church.

Young Howard Rinkel graduated from the Kansas State School of Milling Technology in 1949, and supplies expert milling knowledge as well as doing the millwright work around the mill. He has revised and rebuilt old machinery, installed additional equipment, and has plans for the future.

FACE LIFTING—The new Greenfield Mill as it appears today after a renovation that has preserved many of the old features in use for more than a century.

The mill itself was started in 1834 by Peter Beisel. It was taken over and completed by Amos Davis in 1836, who started it on its almost uninterrupted operation. Many men owned the mill since it started, but the Rinkel family became involved when the late Henry G. Rinkel, father of George, took over the property in 1904. At this time the mill was being operated as a dance hall, and had not milled flour for six months. The dam was broken and the mill pond empty. These were repaired with the help of the neighbors, and by Thanksgiving began operations.

Evidence of Age

The mill building gives considerable evidence of age on the inside, with some of the original floors in use. The whole structure is laced with huge, ancient, hand-hewn beams — one a straight slab of oak, 50 ft. long and 10 in. square. The mill has been remodeled and strengthened through the years, but the basic structure is the same as in 1834. It has the appearance of being able to last for another 100 years. At one time there were nine mills operating on the Fawn River within a distance of around 50 miles, and only the Greenfield Mills remains in operation.

Greenfield Mills was the fulfillment of a dream of the first Mr. Rinkel of owning his own mill, which he had cherished for many years. He was born in Ohio in 1864, migrated to South Dakota at 20 and starved out on a government land claim, and took refuge in flour milling. He started at a lowly job, but worked up to a second miller's position at $60 monthly. His first employer in a mill was a Mr. Tennant, of Aberdeen, S.D., thought to be one of the forerunners of the Tennant & Hoyt Co., now located at Lake City, Minn. In 1888 he went with a Minneapolis mill as a millwright and miller, and after six months became employed by the E. P. Allis Co. as millwright and miller in Duluth, Minn.

He returned to Ohio and, after a few intervening years, took over Greenfield Mills. His wife, Jennie, now the senior member of the family, recounts how she helped run the mill, and many of the trials which confronted them in bringing the mill from a water wheel driven buhr mill to an electrically driven roller mill.

The first Mr. Rinkel died in 1946, and George Rinkel succeeded to the active management. He is extremely proud of the history of the mill, and likes to recall that when it was begun the Potawatomi Indians were roaming the countryside in the area of the mill, and no railroad served the community. Martin Van Buren was president of the United States. The government has designated the old mill as a historic building and it carries a marker attesting to its great age. Foreclosures, sheriff's sales, mortgages and liens mark the early history of the mill.

Now, it has a new found elegance and wears an aura of prosperity.

AT THE AOM MEETING—Busily engaged in conversation between sessions at the recent Association of Operative Millers conference are the two men in the picture on the left. They are R. C. Bradford (left), Pillsbury Mills, Inc., Minneapolis, and J. M. Leese, California Milling Corp., Los Angeles. In the second photo, three Minnesotans are shown having their mid-morning cup of Swedish Plasma. Left to right are Charles R. Veeck, Strong-Scott Mfg. Co.; Robert Hoal, Graton & Knight Co., and Jack Cummings, Pillsbury Mills, all of Minneapolis. In the third picture are Dr. J. A. Shellenberger (left) of Kansas State College and George J. Tesarek of the Quaker Oats Co., St. Joseph, Mo. The picture on the right, illustrating the influence of television on conventions, shows a party in the suite of Tobler, Ernst & Traber watching a ball game between the St. Louis Cardinals and the Chicago Cubs. The man in the rear, center (standing) is Fritz Tobler, manager of the firm, with headquarters in New York.

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AOM CONFERENCE

(Continued from page 1a)

maintenance is becoming increasingly important today and said with the trend toward the "automatic plant" a plant manager should do all that he can do to prepare for that eventuality. He cited his company's own study, and said that during the time of World War I the ratio of total employees to the total of employees in the maintenance department was about 25 to 1, while at the present time the ratio of total employees to employees in the maintenance department is now 9 to 1.

"This means that as we have installed more and more automatic machinery, we have changed personnel to the point that we now have fewer people on production work and more people in maintenance departments."

He said that the maintenance department should be regarded as an operating department, and that the installation of a good preventive maintenance program should be one of the first things done to help the maintenance department do an improved job at less cost.

In conclusion, Mr. Weis said that the installation of a preventive maintenance program should accomplish the following things: reduce maintenance costs, reduce production outtages and promote better management of maintenance departments through an improved scheduling and planning of maintenance work.

Statistical Quality Control

With the increasing trend in the flour milling industry toward the automatic and semi-automatic machinery, an important companion development has been statistical quality control, according to Dewey H. Robbins, superintendent of Fisher Flouring Mills, Seattle, Wash.

Mr. Robbins in an address presented at the afternoon session May 24, said that the savings in manpower resulting from the use of statistical quality control has "generated much enthusiasm, and it is rapidly becoming recognized as one of the basic tools in the control of nearly all manufacturing processes."

Mr. Robbins said that in statistical quality control, the essential tool is the control chart, and explained further that the chart indicates when adjustments to a process should be made. He said that the theory behind this is "based on the fact that any measured quantity of a manufactured product is always subject to

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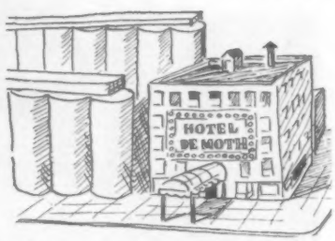

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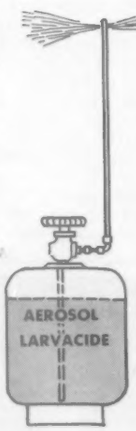

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a certain amount of variation as a result of chance."

Mr. Robbins used the operation of an automatic scale as an example of statistical quality control.

The speaker demonstrated the application of statistical quality control to a hypothetical situation involving the operation of an automatic flour packer packing 100-lb. bags.

Flour and the Baker

R. W. Selman of R. W. Selman and Associates, Kansas City, Mo., told the members of the AOM that bakers as a group believe that "we are now beginning a period of transition in the baking industry and that probably for the next ten years there will be many changes made in bakeshop operations which will affect flour quality and the production of baked goods."

Mr. Selman believes that both bakers and millers must accept the fact that changes in bakeshop operations are accelerating in the baking industry and that the miller must, and will keep up with the advances. He cited as examples of the changes that have come about the trend toward specialization within the baking industry, different methods in mixing bread doughs, bulk shipment of flour, and other changes.

"Most of the bakers with whom I have discussed this topic are of the opinion that better results are obtained in the bakeshop and a more consistent quality loaf of bread is produced when only one kind of flour from one mill is used for a long period of time," Mr. Selman said. He added that it is his opinion that bakers are becoming more and more convinced that the miller has much better facilities for the blending of flour than are present in the average bakeshop.

Mr. Selman suggested to the millers the possibility of investigating the development of selling sponge and dough mixes. He pointed out that there would be many advantages if the miller could find it possible to develop a special flour for use only in bread sponges, containing the yeast foods with the other additives now being widely used in the bakery. He said that most bakers use substantially the same formula for the production of bread and he said this would permit the miller to choose the wheats of the best baking quality, regardless of protein and ash content. "Because it would be virtually impossible for a laboratory to determine the protein and ash of such a mixture," he added.

In summarizing his remarks Mr. Selman told the millers that the first and most important thing a baker expects from the miller is uniformity in baking quality of the flour, and also sufficient tolerance in the flour toward mixing. He said that bakers also expect the flour which is adapted to a particular set of shop conditions which prevail in individual bakeries. Other factors listed by the speaker included a mutual understanding of bakers' and millers' problems, and finally, he said that bakers expect from a mill continued progress toward making a better flour in order that the baker might make a better loaf of bread.

Air Borne Contamination

Flour contaminants borne by the air within a mill are a problem to be contended with in a mill's sanitation program, W. H. Schoenherr, entomologist with the Lauhoff Grain Co., Danville, Ill., said.

Some of the suggestions Mr. Schoenherr gave the millers were: consideration should be given to the location of grain cleaning equipment relative to prevailing winds and milling machinery; windows and doors in the milling building should be kept closed and the necessary incoming air passed through filters, and that the manufacturers of air filters should be alerted to the problems so they can assist in the development of filters that will more effectively remove this type of contamination.

Mr. Schoenherr also said that the importance of vacuum cleaning floors and the discouraging use of compressed air and brooms was shown by the extremely high fragment count in floor sweepings.

Transportation Charges

Though transportation charges constitute an almost insignificant part of the retail selling price of articles, such as electrical appliances, sewing machines, shoes and other wearing apparel, they represent 15 to 20% of the operating cost in the flour milling industry. This point was brought out by J. R. Staley, vice president of the Quaker Oats Co. when he addressed the morning session of the AOM May 25. Robert Ernest, also of Quaker Oats, was moderator.

Mr. Staley, who is in charge of traffic for the Quaker Oats Co., said that the milling industry is a highly competitive one; a difference of ¼¢ per bushel can control the sales of grain, while 1¢ a barrel is sufficient to divert the sale of flour. Because of this, transportation assumes a role of unusual importance. A major factor distinguishing the transportation problems of the milling industry from those of other industries is the availability, the widespread use, and the dependence of the industry upon milling-in-transit privileges. Mr. Sta-

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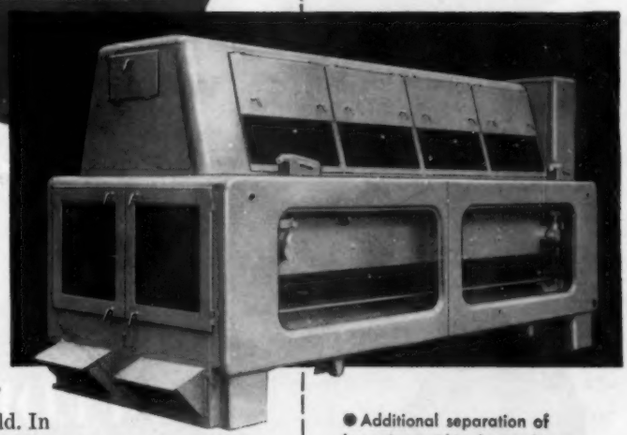

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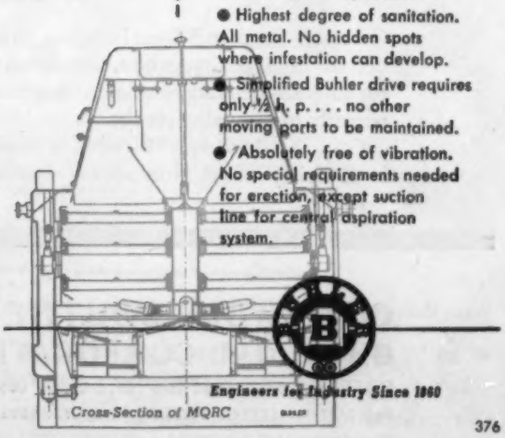

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ley said that while milling-in-transit does have many complications, they are not the mystery which some of the traffic fraternity try to make out.

Mr. Staley explained: "The essence of milling-in-transit arrangements is to make every milling location along the line of transit between the origin of the grain and the ultimate consumer of the grain product competitive."

By means of examples Mr. Staley brought out that the essence of milling-in-transit arrangements is the equalization of competitive factors and that the principle is the protection of the through rate. As an illustration of the complex situation which has arisen, he pointed out that there are rates applying between two points over literally millions of routes. For example, between Dallas, and Detroit, there are 4,717,667 authorized routes. Over every one of these routes the same rate applies. Obviously, Mr. Staley said, some are much longer than others and they pass through points considerably off the tangent from Detroit to Dallas. Because of this there are legitimate opportunities to apply in-bound billing in such a way as to produce lower freight charges than would result from merely paying the balance of rates over the direct route.

Mr. Staley stressed the benefits to be obtained by maintaining close liaison between the traffic department and other departments, particularly the grain purchasing department. Giving a practical example of such benefits he said that on one occasion the manager of the Quaker Oats grain department came to his office to report he had Omaha on the telephone and wanted to give them routing on 100 tons of oats which he was purchasing to go to the mill at St. Joseph, Mo. Mr. Staley asked why the oats had been bought at Omaha instead of Minneapolis, and he was informed that they were 1½¢ bu. cheaper. He explained to the grain official that Minneapolis billing was worth 20½¢ per 100 lb. more than Omaha billing on shipments to the Pacific Coast. Mr. Staley said, "Fifteen minutes and two telephone calls later we had saved $32,000 in freight charges simply by switching this grain order."

New developments, Mr. Staley said, meant many changes and it is essential that many intransit clerical procedures be modernized. He gave several suggestions concerning ways in which this could be done, and he concluded his address by pointing up the changes which will undoubtedly come, particularly as a result of recent developments in bulk handling.

Bulk Handling

Ralph S. Herman, director, bakery sales service department, General Mills, Inc., told members of the AOM that the story of the bulk handling of flour was a very complicated one.

However, he proceeded to make it appear simple by providing an illustrated talk tracing the development of bulk handling from its early stages until the present day.

Using upwards of 40 slides, Mr. Herman brought the members up to date with pictures of the latest equipment, some of which has only just been placed on the road.

Wheat Conditioning

The operation of a vacuum-conditioner was described by Ernest Roth, technical director of Buhler Bros., Swiss milling machinery manufacturer, at the annual convention of the AOM. Mr. Roth's description of the device was supplemented with projection pictures and drawings, and a considerable amount of curiosity or interest was shown by the milling superintendents, who submitted several questions to Mr. Roth in the discussion which followed his lecture.

Mr. Roth also described a system of continuous tempering and conditioning developed by his firm. This system is equipped with automatic controls and permits the use of two 24-hour tempering periods for hard wheats. He said that European milling technologists had found this scheme more desirable.

He admitted, however, that milling technologists "have much to learn" since the separation of bran from endosperm is still far from perfect.

The use of heat in conditioning wheat for milling was practiced more than 40 years ago, the speaker said during the course of presenting some pictures dealing with that subject. He said that the correct use of heat in conditioning wheat brings about some desired improvement in the milling behavior of the wheat "if heat is used correctly."

South American Mill

"One of the most up-to-date and attractive mills in the world" was the description given to a new mill successfully started up a few weeks ago in Sao Paulo, Brazil, by Denys W. Povey, technical executive milling engineer for Thomas Robinson & Son, Ltd., English milling engineering firm, in an address given to the members at the end of the morning session of May 25.

Mr. Povey said that the owners, Anaconda Industrial E Agricola de Cereais, S.A., entrusted Robinson's with the project. This entailed the designing of a building which is entirely new and of contemporary architectural design, the design of 10,000 ton silos of unusual horizontal construction, pneumatic conveying both

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in the all-metal screen room and mill and the chain conveyor intake fed from railway sidings.

The whole mill, Mr. Povey said, takes up six floors. There are two roller floors, three sieving floors, one cyclone and filter floor. The warehouse stretches up to eight floors equipped with high speed packers, and eight double spiral chutes capable of loading 16 trucks simultaneously.

Mr. Povey said that the equipment in the mill includes the latest Robinson "Pneu-Roll" roller mills, fitted with Rollomatic roll and feed control. Each machine is equipped with its own electric motor drive, and there are 334 motors altogether, controlled by an elaborate system with sequence starting and stopping. Eighty-one pneumatic vertical lifts in the plant eliminate horizontal conveying.

Mr. Povey illustrated his lecture with pictures of the mill and with charts showing the planning and method of operation.

Instrumentation Control

Herbert D. Vanderlip, Allis-Chalmers Manufacturing Co., spoke on instrumentation control in the flour mill, a subject which attracted the interest of the members present. With the help of Arlin B. Ward, Pillsbury Mills, Inc., he illustrated the fundamentals of human controls which can be applied in a more detailed fashion to controls in a modern production facility, such as a flour mill.

Mr. Ward was selected for his position as assistant because of his capacity as moderator of the Wednesday afternoon session.

Mr. Vanderlip projected pictures of the various instruments already available to the industry, including the Massometer of Wallace & Tiernan, Inc., and instruments of other companies besides those available from his own organization. He stressed the importance of feed back controls as a form of police action and added that instrumentation control could give lower production costs insomuch as it saves on labor charges as well as on power charges. Other important factors mentioned by the speaker were quality control and the achievement of optimum yield.

Pneumatic Conveying

The principle of pneumatics has been applied for the conveying of grain and other materials for more than 50 years, according to Frank M. Heide, MIAG, NorthAmerica, Inc., of Minneapolis. Mr. Heide spoke on "The Application of Pneumatic Conveying in Flour Milling" before the members of the Association of Operative Millers at that organization's annual convention in St. Louis May 23-26.

He said that the first patent covering the application of pneumatic conveying for mill stocks had been granted more than 45 years ago to a member of the staff of his parent company, MIAG.

Mr. Heide's address before the Opperative Millers was in the form of an illustrated lecture and he used about 30 projection pictures to illustrate his points about pneumatic conveying.

He said that pneumatic systems can be defined or classified according to the pressure applied, and added that the three usual designations are high, medium and low pressure systems. Mr. Heide believes that the medium pressure system is the most economical and the most flexible system in regard to its use in a pneumatically equipped cleaning house or a pneumatic flour mill.

The principal advantage of a pneumatic grain cleaning system, Mr. Heide said, can be "summarized as bringing about a clean and sanitary cleaning house with a substantial decrease of fire danger, thoroughly clean grain and an appreciable saving in floor space." He added that the somewhat higher power consumption for the pneumatic system is frequently considered to be a disadvantage, but as a matter of fact, the efficient layout of a new cleaning house with suitable machinery requires only slightly more power than the conventional cleaning system.

In connection with pneumatic conveying of mill stocks, Mr. Heide asserted that an important part of such a system is its cyclone separators. He said that the diameter of the cyclone has to be selected according to the amount and particle size of the stock in relation to the air velocity used. In connection with power requirements, he estimated that a power of 2.8 to 3.7 horsepower per 100 lb. of flour capacity is required.

Purifier Operation

A discussion of the operation of middlings purifiers was presented by Eric Stanger, North American manager of Henry Simon, Ltd. Mr. Stanger in his lecture pointed out that the purifier has two main purposes: It is required to separate a clean, granular stock from the mixed, branny particles and to divide the clean stock into accurately graded fractions for feeding to the succeeding reduction rolls. He said that a good purifier is "one which separates and grades the clean stock as well as possible, is simple to operate, and is economical in air and space, and has a high capacity with a minimum of power consumption."

Mr. Stanger's lecture was accompanied by a number of projection

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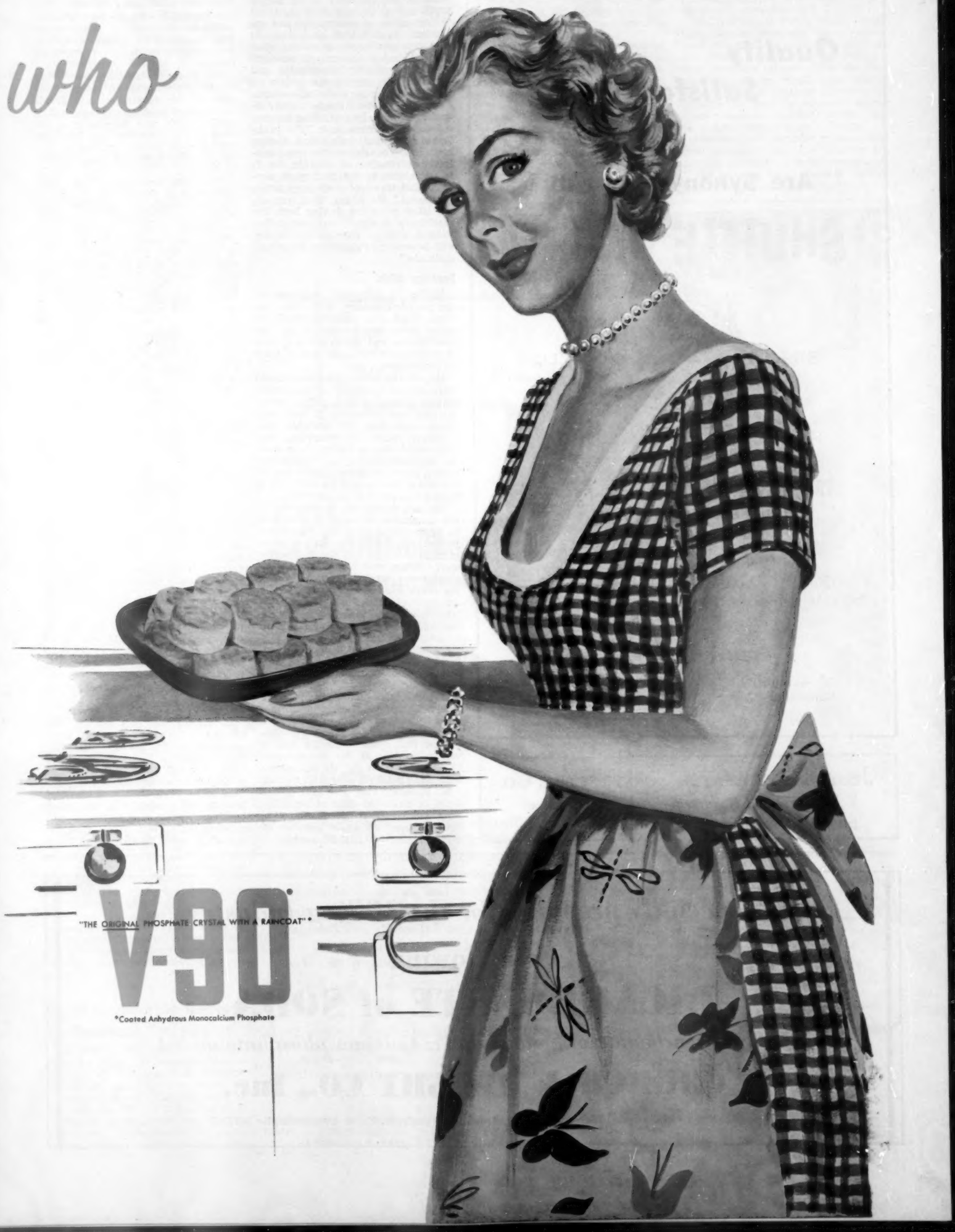

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slides of the operation of the Simon purifier, and he described in detail the principles of construction and operation. He said that his company's new auto purifier was developed after a considerable amount of research in his company's laboratories and through the suggestions and comments made by the technical research committee of the Association of Operative Millers. In describing his machine, Mr. Stanger said: "The problem in purifier design has always been how to achieve the most uniform distribution of the air, for it is upon this factor that good coverage and travel of stock very largely depend." He added "that increasing labor costs are driving both the machinery designer and the miller toward simpler construction which will be easier to supervise, clean and maintain."

Foreign Mills

Philip W. Pillsbury, chairman of the board, Pillsbury Mills, Inc., advised flour mill superintendents to adopt their own "five-year" or "10-year" plans and carry out a system of progressive modernization of their milling plants.

He told the millers that they should draw up an inventory of machinery and equipment in their plants, noting the age and condition of each machine, and also its probable life. Equipped with this schedule, they then could plan to budget their capital expenditures for new equipment over a period of several years and at the end of that period, he said, "you'll have a mill you'll be proud of."

The mill executive's advice came at the conclusion of an illustrated talk he presented. A large number of projection pictures taken on his tours of mills in Africa and South America were shown, and Mr. Pillsbury described the conditions under which the mills were forced to operate. A shortage of skilled and dependable labor, and a shortage of wheat were the two most common problems to be met, he said.

Included in the collection of pictures were some which showed how flour is marketed in the native bazaars in Africa.

His illustrated lecture drew a large audience, and the selection of pictures which was shown to the millers indicated that Mr. Pillsbury's experience as an operative miller serves him in good stead, for his audience found the pictures and Mr. Pillsbury's descriptive remarks quite interesting.

W. P. Riley, vice president of the AOM, in his introduction of Mr. Pillsbury, pointed out that the mill executive has been an active member of the AOM for the past 30 years.

Recovery of Waste Products

A process for the recovery of waste products from wheat wash water was described by Frank R. Ofner, a consulting engineer of Portland, Oregon.

Mr. Ofner prefaced his description of the process with an extended review of the advantages and disadvantages of washing of wheat before milling. This was principally a review of the literature that has been published on the subject, and he listed the advantages and disadvantages in detail.

"In recent years several tests have been made of the quantity and quality of waste products from the wheat washer," Mr. Ofner said, "adding that the results of these tests vary from slightly less than ½ of 1% to slightly more than 1½% solids in the waste water when recommended ratios of gallons of water to bushels of wheat to be washed are used." He said that millers have recognized the value of that solid by-product in the water, and that the experimental work has resulted in the use today of the settling-basin and shaker-screen processes. The shaker-screen process provides for the waste water of the washer to be passed over a vibrating screen where the larger particles of broken grain, seeds, etc., are retained on the screen and the water is discharged. The recovered particles are then passed by the shaking action to and through a screw press which removes the excess water. The damp screenings recovered are mixed with dry screenings and sent to mill feeds.

The second recovery method in use today to recover screenings with water is the use of a settling tank or basin, which traps some of the suspended solids. The material so trapped is then shoveled out two or three times a week and is removed to the dump by the local refuse collector or to a feed bin. Mr. Ofner brought out that there is normally no financial return to the mill in such instances. He said that after several tests in a West Coast flour mill using the shaker screen process, it was estimated that the mill recovered screenings over and above all charges for maintenance in an amount to exceed $25,000 a year.

In summarizing his lecture, Mr. Ofner said that the new patent process provides the miller with additional incentive to wash his wheat. "Not only will all of the advantage of the wheat washer make his operation more profitable, but the new process and washer will turn what has been known as reasons for not washing wheat into actual cash returns," he said. He added that there

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is no longer a justifiable reason for any flour mill not washing its wheat and said that "if properly used, the new washer and process will not only increase the kind and quality of the products, but will allow the miller to account for over 100% of his purchased weight of grain in the finished product."

Automatic Weight Control

An illustrated lecture dealing with automatic weight control in bulk materials handling was presented by Ingram Richardson, president, Richardson Scale Co., Clifton, N.J. In his illustrated lecture, Mr. Richardson discussed some of the problems which must be solved by design engineers in developing automatic and semi-automatic weighing and bulk handling equipment. He said that the conventional dormant beam scale has been "accurate for 100 years, but it will not fill the bill in an automatic process which requires remote indication, recording, totalizing and remote formulation."

With the aid of projection pictures, Mr. Richardson described some of the recent new developments in equipment for feeding bulk materials. He showed a screw feeder that has been designed by his company to reduce the pulsation of the material as it is delivered by the conveyor. To illustrate the problems that must be solved in designing an automatic system, Mr. Richardson cited an example of an installation made by his company in a modern rubber plant. The equipment handles 43 different ingredients, all under the direction of one operator in a distant control room. Mr. Richardson traced the path of the materials through the machine and described its operation.

In conclusion, the speaker said that for proportioning multiple ingredients in a single weigh hopper, multiple weight selecting berniers and potentiometers are used. These are set at an increasing value for cumulative weighing, or the scale can discharge the contents each time, thereby making consecutive weighings according to the values established on the various weight selectors.

"Automatic weighing seems inherently well suited to automatic or semi-automatic bulk handling installations," he said. "As the new marvels of industrial control are unveiled, they can be applied to automatic weighing for still greater productivity and improved quality control in bulk materials handling by weight," Mr. Richardson concluded.

Movement of Moisture

Movements of moisture in the wheat kernel were described in a paper by Gordon Grosh, graduate research assistant at Kansas State College. An article on this subject by Mr. Grosh will be appearing in early issues of The Northwestern Miller and Milling Production.

Another talk at the technical conference was made by John E. Ake of the Quaker Oats Co., Akron, Ohio. He discussed electrostatic grain cleaning, which was developed by his firm.

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AOM Committee Reports On Research Projects

ST. LOUIS, MO.—Tibor A. Rozsa, Pillsbury Mills, Inc., presided over a meeting of the technical research committee of the Association of Operative Millers on May 22 prior to the opening of the main technical conference at St. Louis May 23. The committee, which consists of members of the main milling companies as well as Dr. J. A. Shellenberger, Kansas State College, Manhattan, Kansas, received reports on a number of technical projects that have been undertaken in the past year and laid plans for further developments.

E. S. Dybevick, International Milling Co., presented the report of the sub-committee on purification. The committee was told that tests had been made using three different machines, the products of machinery manufacturers, and the members discussed in detail various procedures used with a view to continuing the experiments in their own plants. It was felt that standardization in testing was desirable and the project reported upon by Mr. Dybevick was of considerable assistance in formulating such a plan.

The report of the sub-committee examining bulk handling was presented by Richard C. Bradford, Pillsbury Mills, Inc., and the research committee agreed to circulate a questionnaire to mills containing three questions. The first was framed in an effort to determine what proportion of flour mill output is currently handled in bulk, the second to ascertain millers problems arising out of the switch to bulk handling, and the third to discover preferences for the various container types and loading equipment available.

Ralph Bouskill, Purity Flour Mills, Ltd., Canada, presented the report of the sub-committee on the progress of the wheat conditioning project. It was generally agreed that the examination of the wheat conditioning question should continue for there is considerable need for research. Since there are many questions which concern management it was decided to recommend to operative millers that they should discuss the question in greater detail with their executives.

The growing trend towards instru-

(Continued on page 14a)

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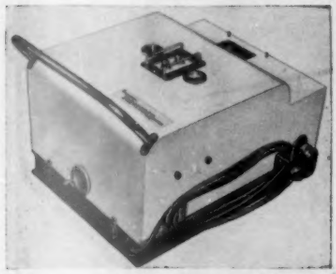
No. 4025—Fluidizer

The introduction of a new machine system which pumps granulated solid materials like water has been announced by Superior Separator Co. The machine system, called the Superior "Fluidizer," has successfully handled products such as wheat, oat and soy flours, ground feeds, clay and similar particulated materials. Uses



of the "Fluidizer" include unloading bulk rail cars at bakery and mill sites, loading cars at production sites, loading and unloading trucks, stationary or portable bins, and general conveying in production systems. Capacities range from 100 to more than 1,000 lb. per minute. The machines will transport materials vertically or horizontally, up to 200 ft. Arranged in sequences, they can move materials practically any distance, the company said. The "Fluidizer" is made in both portable and stationary models, in five sizes. The two smaller sizes incorporate the Superior principles; the three larger units are based on the Atkinson principle, known as the actuator. The machines will be manufactured by Superior on a working agreement with Atkinson Milling Co. Superior says the "Fluidizer can provide continuous flow with a small amount of air and low horsepower input. Ratios of air to solids have reached as high as 1 to 256 in the conveying line." For further information, check No. 4025 on the coupon and drop it in the mail.

No. 5140—Ramps

Two new types of "lightweight" magnesium dock boards and truck ramps manufactured under the trade name "Mag" are announced by the Copperloy Corp. "Maggie," the lightweight dock board, is available in a wide variety of sizes and weights. Model CM 112 has a capacity up to 12,000 lb. The Big Mike truck ramp, model CM 113, is available in capacities up to 20,000 lb. New literature on these products may be obtained by checking No. 5140 on the coupon and mailing it to this publication.

No. 4027—Grain Conditioner

A grain conditioner, developed by the Entoleter Division of the Safety Car Heating & Lighting Co., Inc., in cooperation with the Quaker Oats Co., is now available following a period of field testing. The machine

consists of a paddle-type stainless steel conveyor in which a series of steam jets are installed, and allows for closely controlled application of wet steam to the grain moving through the conveyor. The discharge temperature can be controlled through thermostatic equipment.

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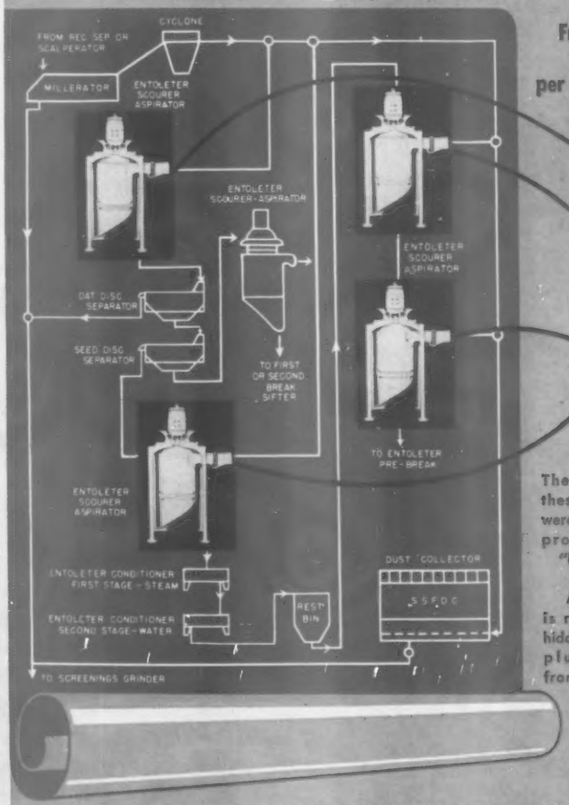

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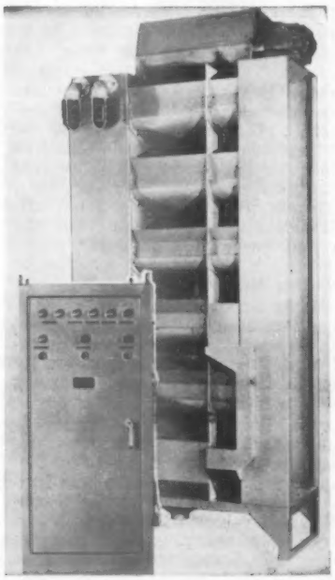
Temperature and pressure gauges are supplied with the conditioner. Auxiliary equipment includes automatic controls which shut off the steam if either the supply of grain or the electric current be cut off. The conditioner is insulated with Fiberglas. More information regarding this conditioner may be obtained by circling No. 4027 on the accompanying coupon and mailing it to this publication.

No. 4026—Electrostatic Separator

The manufacture of an electrostatic separator for the grain industry has been announced by Superior Separator Co. The company says the machine has particular interest to processors and handlers interested in sanitation because of its



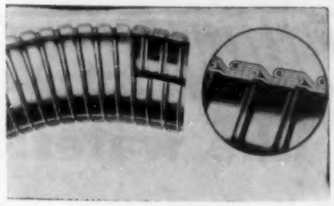
ability to remove contamination from grain. The machine, called "Coronatron," was developed by the mechanical research department of Quaker Oats Co. It will be manufactured and distributed by Superior. The machine works on an electrostatic principle and will handle separations which do not lend themselves to standard air, mechanical or flotation separating equipment, the company says. It is made of several basic units and can be adapted to various separation problems. A broad range of capacities is available. The "Coronatron" has been applied in various ways, for instance in cleaning cereal grains such as corn, wheat, rye, oats; cereal products such as farina, semolina, corn meal, etc. The machine has many uses, the company notes, but of most interest is its application in meeting grain sanitation standards. For further information, check No. 4026 on the coupon and drop it in the mail.

No. 5196—Grain Handling

The Vac-U-Vator line of portable pneumatic grain handling and cleaning equipment, manufactured by Dunbar Kapple, Inc., has been augmented by the addition of the No. 980 large capacity model to the standard No. 900, and the smaller No. 670 models. New features of the model No. 980 include a rocking bolster under the frame to permit better roadability, more power and higher capacity. To secure more complete information check No. 5196 on the coupon and drop it in the mail.

No. 5153—Conveyor

A new flexible metal hose, especially designed for use in conveying materials having abrasive and corrosive characteristics such as grains and bulk chemicals has been announced by the Universal Metal Hose Co. Two types are available—U-100-L standard weight (.015 in. galvanized steel strip) and U-120-L heavy-duty (.020 in. galvanized strip). Both types are furnished with .012 in. stainless steel strip liner, unless a carbon liner will satisfy and is specified. Six standard sizes (3, 4,



5, 6, 7 and 8 in. I.D.) are available in both types. Other sizes may be had on special order. For more complete details check No. 5153 on the coupon and mail it.

No. 5099—Bagging Machine

Union Bag & Paper Corp., sales agent for Inglett & Corley's new I & C bagger (model UB-101) has announced that the machine is ready for distribution. The machine works in conjunction with a moving conveyor and sewing head. The weighing and filling cycle is automatic. A starter button automatically permits delivery of the pre-weighed material through the machine's bag chute in an endless series. The filled weight drops each of the open mouth multi-

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Now, after 5 years of research and field testing, Douglas brings you the first practical answer to the problem of costly grain losses due to insect infestation.

Douglas TETRAKOTE is a long-lasting, economical liquid grain protectant. It is applied when clean grain goes into storage or when stored grain is turned, and keeps grain insect-free during normal storage periods.

HOW LONG DOES PROTECTION LAST?

A full year! One application of Douglas TETRAKOTE will provide positive protection for periods up to 12 months when handled according to directions.

WILL TETRAKOTE WEAR OFF?

No! TETRAKOTE is formulated to stay on during normal handling. Grain treated with TETRAKOTE can be turned, moved, cleaned or handled in any way without reducing the effectiveness of the protective coating.

IS TETRAKOTE ECONOMICAL TO USE?

Definitely! In fact, it costs you more not to use Douglas TETRAKOTE. Insects can easily cause losses amounting to 75c or $1.00 per bushel in 8 to 12 months. The average cost of applying TETRAKOTE is less than 2c per bushel. One application of TETRAKOTE more than pays for the cost of the protectant.

IS TETRAKOTE SAFE TO USE?

Yes! The insect killer in TETRAKOTE is harmless when used as directed. In the milling, eating and germinative qualities of grain, it is approved for application directly on grains and seeds used for human consumption.

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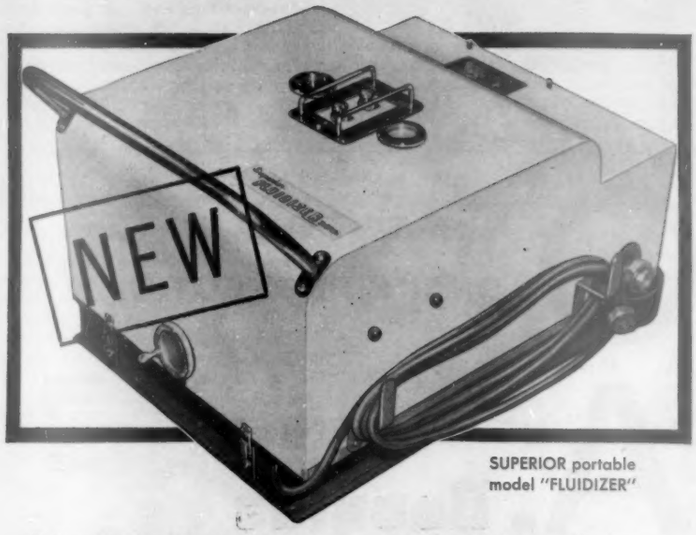

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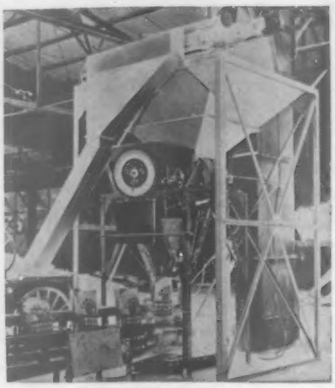
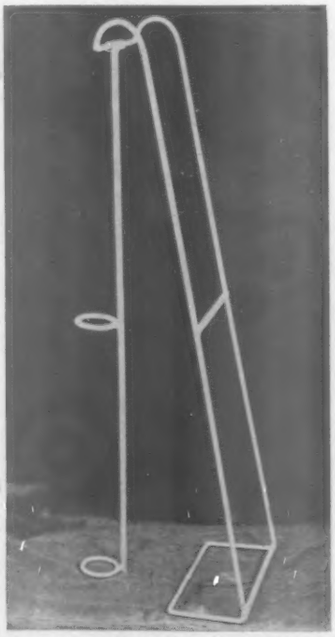


wall bags onto a moving conveyor belt which leads them through the sewing head. A dial type scale is double-faced so that both the closing and filling operators can see it. This model will weigh units from 25 to 200 lb. A system of switches within reach of the bagging operator enables him to change weight units immediately by operating the switch covering the desired unit. To secure more complete details check No. 5099 on the coupon and drop it in the mail.

No. 5198—Box Car Door Ladder

A new device, a grain door boxcar ladder, is being distributed by a Calgary firm. It enables an operator to vacate the car with safety and ease after installing the grain doors. Made of metal, the ladder straddles the grain door, the hinge being near the top. It extends down both



sides a little over 4 ft. and contains two steps inside. Two rungs outside enable the operator to manipulate the loading spout. The ladder must be removed before the boxcar door can be closed since it extends about 8 in. from the door at the bottom. To secure more complete information check No. 5198 on the coupon and mail it.

RESEARCH GROUP

(Continued from page 11a)

mentation control in flour milling production was another facet of technology which occupied the attention of the research committee. The report was presented by Dewey Robbins, Fisher Flouring Mills, Seattle, Wash. It was brought out in both the report and in the discussion that there was lack of understanding of the value and use of many of the instruments now being developed and the committee decided to pose the question "What can be done to explain instrumentation to millers?" and, conversly "What can be done to explain to manufacturers why millers cannot use or do not find value in a particular instrument?" It was felt that more knowledge would get rid of the difficulties.

Mr. Robbins presented W. R. Bell and R. G. Ellis of the Taylor Instrument Co. who talked on their firm's developments. Mr. Robbins also presented Ingram Richardson of the Richardson Scale Co., who talked on instrumentation as far as concerned his own products. Denys Povey, Thomas Robinson and Son, Ltd., Rochdale, England, presented the committee with a summary of his company's latest developments in milling technology.

H. R. Straight, Straight Engineering Co., displayed a working model of his newly developed box car dumping device, the demonstration of which aroused some interest among the members.

Mr. Rozsa expressed himself as pleased with the work done by the research committee and pointed out that such projects as they have been handling in the past year can be of considerable value to the milling industry. Both operatives and management will benefit from the inquiries which are being made and the reports which are being prepared.

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AOM Conference Cuffnotes

The accent at the annual technical conference of the Association of Operative Millers at St. Louis was on improvements . . . better techniques . . . modernization of machinery . . . more efficient ways of doing things. Herbert D. Vanderlip, Allis-Chalmers Manufacturing Co., indulged in a piece of whimsy at the end of his talk on instrumentation control in the flour mill. He screened a picture of a huge control board containing rows and rows of dials. All the trick miller of the future will have to do, he said, is come to work, push a few buttons, then put his feet up on the table and read the latest issue of his favorite milling journal.

●

Raymond R. Tucker, mayor of St. Louis, could not keep his appointment to welcome the millers to his city. He sent an official in his stead. The official said the presence of the millers in St. Louis was particularly appropriate because St. Louis was a brewing town and the brewers depended upon the millers. Donald S. Eber, secretary of AOM, wondered out loud in what way the brewers depended on the millers. His point was well taken in view of the heat and the humidity in the city.

●

The mayor's absence was due to business in connection with an election scheduled for May 26. Consternation reigned when thirsty meeting attenders were released from the morning session on that day. The bars had notices "Due to election, all bars closed till 7:30 p.m." Thanks to the hospitality of the many allied tradesmen, the situation was soon remedied.

●

Youngest man in attendance was 13-year-old William Crow, son of Ross E. Crow, Preston-Shaffer Milling Co. Proudly wearing the insignia of an associate member, he gave a thorough inspection to the machinery and equipment on show. He "thinks" he would like to become a miller.

●

The cosmopolitan atmosphere of the AOM conference was well maintained by the presence of many visitors from overseas and from Canada. From Australia came Acher Jedlin, Vita-Cereal Products, Sydney . . . from Christchurch, New Zealand, came James K. Ireland, D. H. Brown & Son, Ltd. August Tobler, a director of the Swiss Silk Bolting Cloth Manufacturing Co., was a popular visitor . . . so was Gilles Renaud, Tripette et Renaud, Paris.

●

The foreign flour milling machinery firms sent highly qualified representatives. For Buhler Bros. came Ernest Roth and he was supported by the North American staffers, Fritz Shiess, Rudolph C. Moore and Fred Schumacher. MIAG North-America, Inc., was represented by Frank Heide and Peter Goldberg. From England came C. Salkeld Robinson, joint managing director of Thomas Robinson & Son, Ltd., together with Denys W. Povey, technical executive milling engineer. Completing the Robinson contingent was George Hayward, the firm's representative in North America.

●

Henry Simon, Ltd. had five men on hand, headed by Eric A. Stanger, Minneapolis, recently appointed manager for North America, and Gerald Griffin. From Toronto came Roy Stott, David Casson and James H. Tyler.

●

Native St. Louisans raised a few eyebrows when a party of Englishmen, with an American escort, to say nothing of an Irishman visited a local bowling alley to see what it was that attracted the U.S. sportsman. As soon as it was realized that the aim was not to weave the ball around the pins and have it slide off through the gutter the Englishmen started to score. Score is probably not the right word but they gathered a few points.

●

Messages of congratulation to AOM were received from Clint Brooke, Merck & Co. Inc., secretary of the American Association of Cereal Chemists, and from the Swedish Milling Assn.

●

Talk around the tables was concentrated on the modernization trend in the industry. Few firms can afford to expend the hundreds of thousands of dollars needed to do a thorough job at one time. So, it is forecast, there will be a gradual replacement of equipment during the next few years. In total, the expenditure will come to several million dollars. American and foreign firms will share in the business.

●

Don Eber recalled that at the 1950 conference, also held in St. Louis, an unknown entertainer appeared for $150. Recently he made another appearance in St. Louis for a fee of $7,500. His name? George Gobel.

●

Wallace & Tiernan did the usual proficient job in providing the millers

THERE WERE BUGS IN THOSE DAYS

How good a grain fumigant are you getting these days? Well, to tell the truth, about half the time you can't really say.

In the old days, chances were you had plenty of live, visible bugs before you decided to treat. Sometimes you'd had the infestation a month or two. (You might have been waiting to see if you were going to load out the grain before definitely deciding on treating.) Meanwhile the bugs were getting more numerous and this wasn't helping grain condition—always a factor in fumigation.

In short, we had bugs in those days. And it took a rugged grain fumigant to clobber 'em.

Now, in this era of Food & Drug enforcement, what do you get? Usually: light infestations; occasionally: medium; rarely: heavy—but that's getting to be the exception. Half the time you're anticipating; you're treating from fright—and with good reason. You can't afford not to. If you sell grain that has or has had appreciable infestation in it to a miller or processor, the fragment count will tell the story and that will react on you. As seller of the grain you even have to be afraid of a shadow—the shadow of internal infestation on X-ray film.

If this occasionally means unnecessary treating, that, in itself, isn't too rough. For if you use a fumigant worthy of the name, you can still treat grain preventively in concrete or steel tanks for ¼c to ½c per bushel. And most elevator men agree that's pretty cheap insurance if it forestalls further trouble.

But here's the catch: Unless you know for certain that the grain would have become infested, you don't have any real check on the fumigant.

What's the answer? It's just this: a grain fumigant that was rugged enough to give good results 10 to 25 years ago, had to be good enough to do an all-around job. It not only had to kill the visible adults on which results were immediately judged. It also had to kill the eggs, larvae and pupae. If it didn't you had reinfestation within 30 days.

A few products did it. Most of them didn't. A few products will do it now. Most of them won't—not unless you use one of those "drowning" dosages recommended on many labels.

Weevil-Cide is one fumigant that will—and always did. Its reputation for effectiveness and dependability was founded in an era when you had bugs *before* you fumigated—not *after*. And no label would have dared *say* "re-treat as needed" — even though it was often needed.

Weevil-Cide will control all stages of grain insects better, will do it under a wider variety of conditions, and will do it more economically than any other commercial grain fumigant. So whether you treat preventively or when the chips are down, Weevil-Cide is your best bet.

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and the allied tradesmen with a fresh carnation each morning. These, with the colorful identification badges, red for the operative millers, blue for the tradesmen, and white for the ladies, helped set the stage for the spirited and lively nature of the discussions, formal and informal. Registration was efficiently handled under the direction of Arlin B. Ward, Pillsbury Mills, Inc. and Robert Popma, A. E. Staley Manufacturing Co.

●

Howard R. Dederick, Mechanical Felt & Textiles Co., Weehawken, N.J., interested his friends with an account of his plans for a forthcoming trip to Europe during which he will visit 11 countries. His visits will be partly business, partly pleasure.

●

Of all the many facets of flour production, perhaps purification came in for more discussion this year. Many of the engineering firms had purifiers on display and the situation was brought into sharp focus by Eric A. Stanger, Henry Simon, Ltd., who surveyed the field as far as his firm's experience was concerned. Comment was made, incidentally, on the careful preparation that so obviously had gone into the talk. Assisting the projector operator was Simon's James Tyler who was armed with a cue sheet. The lecturer did not have to ask for slides . . . the illustration or chart appeared as soon as he hit that particular portion of the talk. Preplanning provided smooth delivery and operation.

●

Prof. R. O. Pence, department of flour and feed milling industries, Kansas State College, Manhattan, had to work under a handicap during the first day of the AOM convention in St. Louis. Mr. Pence had planned his visit to the convention to permit spending some time with his son and family in St. Louis and "Grandpa" Pence was playing with one of his grandchildren. The girl snatched Mr. Pence's glasses off, dropping them to the floor and breaking both lenses. Monday morning Prof. Pence went to a St. Louis oculist and was able to get a new pair of spectacles by late afternoon.

●

Philip W. Pillsbury, chairman of the board, Pillsbury Mills, and one of the featured speakers at the convention, has been an active member of the organization for the past 30 years. He recalled that he had attended his first AOM convention in St. Louis in 1925.

●

Mrs. Warren Keller, wife of the manager of the flour service department of Sterwin Chemicals, Inc., Kansas City, "hitch-hiked" to St. Louis for the convention. P. F. Winburn, manager of Industrial Fumigant Co., Kansas City, flew his company's plane back to Kansas City for business and invited Mrs. Keller to accompany him back to the convention, and Mrs. Keller, of course, accepted the invitation.

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—BREAD IS THE STAFF OF LIFE—

Cargill Mercury Test

• • •

By Arvid J. Kuutti

EDITOR'S NOTE: Arvid J. Kuutti of Cargill, Inc., Minneapolis, the author of the accompanying article, notes that the situation resulting from the use of mercury organicals as fungicides in seed treating industries has forced the starting of a campaign on the presence of treated seeds in food grains. The amount of mercury organical treated wheat found in food channels is steadily increasing, he says. And these materials are very poisonous to man and animal. Mr. Kuutti explains that his firm has devised a simple test for detecting mercury in seed grains, and it is believed that this test will help both the Food and Drug Administration and private industries in controlling to some extent the amount of treated seed which gets into grain channels and is offered to grain firms engaged. in providing raw materials for the food industries. Up to the present time, Mr. Kuutti says, it has been almost impossible to detect certain of the mercury organicals. Ceresan in particular, he says, has been the most difficult to detect because the appearance of the material is almost exactly the same as that of grain starch. In the accompanying article Mr. Kuutti describes the Cargill Mercury test.

The presence of increasing amounts of treated seed wheat with industrial wheat channeled for food consumption has compelled us to devise a rapid technique for detecting mercury. Most of the treated wheat has as a fungicide Ceresan, Panogen, liquid 364, or Panodrin. All of these are mercury organicals which are extremely poisonous.

Some of the materials used for treatment (such as Panogen) are easily detected with a black light such as the G.E. 15 watt black light. Ceresan is very difficult to detect except to some extent with a microscope.

It is principally for the Ceresan

detection that this test was devised:

Equipment:

(a) A balance capable of weighing up to 1/100 of a gram.
(b) 2 (30 ml) pyrex test tubes.
(c) Small glass funnel 65 mm diameter.
(d) 2 (150 ml) beakers with stirring rods.
(e) 25 ml graduated cylinder.
(f) Hot plate.
(g) 5 ml Mohr pipette.
(h) Standard laboratory equipment is helpful but not necessarily essential.
(i) Test tube brush.

Solutions and Chemicals:

(a) 5% sodium hypochlorite C.P. 5-6% available chlorine.
(b) Sodium bisulfite C.P. Reagent grade.
(c) Dithizone in chloroform (Concentration 3 mgms per liter).
(d) Distilled water.
(e) Untreated wheat.

Procedure:

(It is imperative that all equipment be immaculately clean. A soap such as Lava soap has been found to be excellent. Lather a small test tube brush in Lava soap. Scrub test tubes inside and out. Do the same with the beakers. Wash all equipment such as spatulas, stirring rods, graduated cylinders, and pipettes and rinse with distilled water.)

(a) Weigh 10 grams of wheat into 1 beaker (150 ml) and 10 grams of untreated wheat into another.
(b) Add 20 ml of distilled water to each tube.
(c) Add exactly 2 ml of 5% solution of sodium hypochlorite C.P. grade. Stir with glass rod.
(d) Heat up to a boil. (Do not boil.) Stir.

Decant solution into the test tube through a very thin cotton mat in the 65 mm diameter funnel.

(e) Add .2 gram sodium bisulfide directly to the test tubes. Shake the tube thoroughly.
(f) Cool the tubes thoroughly with cold tap water.
(g) Add into each tube (after cooling) 1 ml of dithizone solution. (Concentration 3 mgs per liter)
(h) Shake the tube thoroughly for 15 seconds or more. Allow to settle.

Result:

The untreated wheat will show a distinct green color in the dithizone layer. The treated wheat will be almost colorless to a shade of pink or light yellow.

Discussion:

If the color of the untreated wheat is not green, this will indicate that the equipment or hands were not clean. The thumb technique with the test tubes can be used with no difficulty and in every case the untreated sample should be first in order of testing. In other words, always test the two samples treated and untreated simultaneously and always apply chemicals, etc., to untreated sample first in order. An absolutely clean stopper for the test tubes might be desirable, and if it is used, the stopper should be removed between each step of the testing.

It is recognized that this test is not entirely specific. The test is very effective for detecting treated wheat or other grains. With slight modification, the test can be made entirely specific and reference is hereby made to work by A. K. Klein, A.O.A.C. Vol. 35, No. 2, Aug. 15, 1952.

The initial digestion of the sample can be eliminated since the hot hypochlorite will convert the mercury organical into a form which is available to the dithizone. This is one of the important features of the Cargill test.

The test is very effective for 1-2% of treated seed in a particular sample. Beyond this range a larger sample and a modified application of treatment employing parts of Klein's work can be used and the digestion can be eliminated.

—BREAD IS THE STAFF OF LIFE—

Sales Supervisor

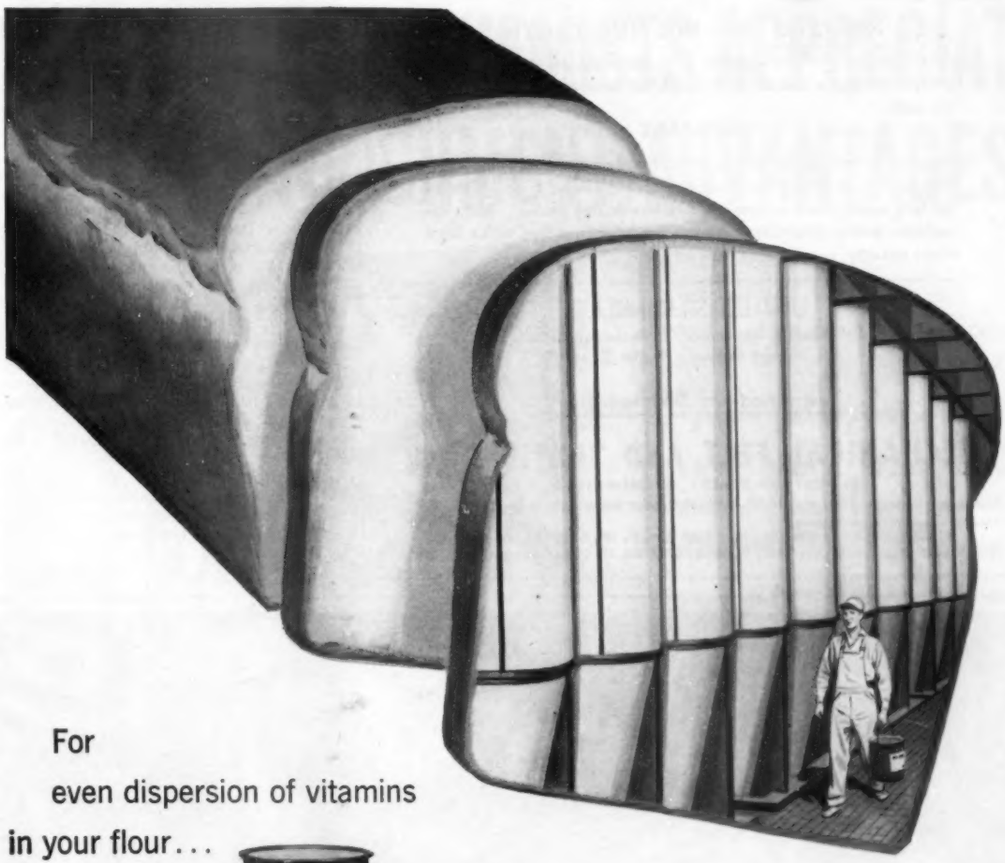
WORCESTER, MASS.—Ed Pickett has been named district sales supervisor for all Graton & Knight products sold in the southeastern U.S., according to John G. Henrikson, sales manager of the company.

Sprout-Waldron Extends Canadian Connections

MUNCY, PA.—Strong-Scott, Ltd., Winnipeg, has been appointed exclusive sales agents for Canada by Sprout, Waldron & Co., Inc. Making the announcement, Harold J. Alsted, vice president in charge of sales for Sprout-Waldron, explains that this alliance, which has been formed to served the whole of the Canadian grain processing industry, will not affect the recently announced international agreement between his company and Buhler Bros., Uzwil, Switzerland.

The Buhler line of flour milling equipment in Canada will continue to be offered by the Buhler organization direct from its Canadian headquarters in Toronto.

Strong-Scott will continue to manufacture its own machines at the Winnipeg plant and will offer other machines not competitive with Sprout-Waldron products. Additionally, the Canadian company will carry a stock of spare parts for Sprout-Waldron.



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Developments in Prevention of Stored Grain Infestation

By Randall Latta

EDITOR'S NOTE: Recent developments in the protection of stored grain against insect destruction and contamination were described by Randall Latta at the National Grain Sanitation Conference in Kansas City. This article is a reprint of his talk. Mr. Latta is head of the Stored Products Insects Section of the U.S. Department of Agriculture's Marketing Service.

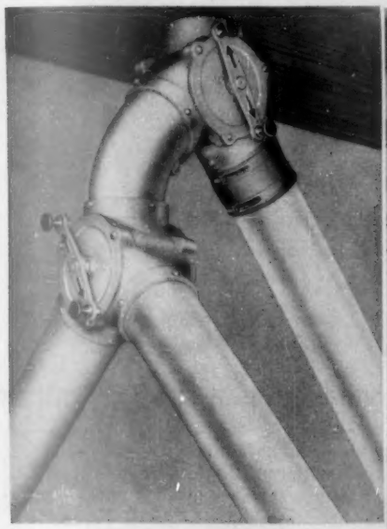
In the many discussions of grain sanitation in the past two or three years by industry and governmental committees, and various individuals, the need for an expanded research program on insect control methods has been universally recognized. In some instances the impression is given that practically no control measures are available and that a dire state of affairs exists. Of course, that is a misrepresentation of the situation.

The U.S. Department of Agriculture has carried on for many years a research program to develop methods of control for insects attacking stored grains. Some phases of this program date back as far as 1920. From these studies have come very effective control measures such as fumigation, clean-up of storage bins and elimination of local sources of infestation, and a thorough knowledge of the insects involved and their habits, as well as the relation between grain condition and insect infestation. Actually, if the methods existing today were universally used throughout the grain trade, insect infestation in stored grain would be a minor problem.

However, the progress of events does not permit research to stand still. In recent years there have been extensive changes in grain handling practices. We now store great quantities of grain for two, three, and even five years instead of from harvest to harvest. The trade has become more and more aware of the losses from insect infestation, not only those caused by the actual grain destroyed, but those related to spoilage, downgrading, and contamination. The research program in turn has been directed towards improving the control measures now used, and developing new ones. Emphasis has been placed on preventing insect attack in the first place.

The present research program is the largest ever devoted to this problem, and several new developments are just around the corner. It will be the purpose at this time to reveal briefly the most promising items of progress. These studies have been carried out at Manhattan, Kansas, by A. C. Apt, N. M. Dennis, J. K. Quinlan, G. H. Spitler and G. D. White, under the direction of H. H. Walkden.

The lack of a rapid, simple, and fool-proof method for determining hidden infestation has been of great concern to those persons involved in



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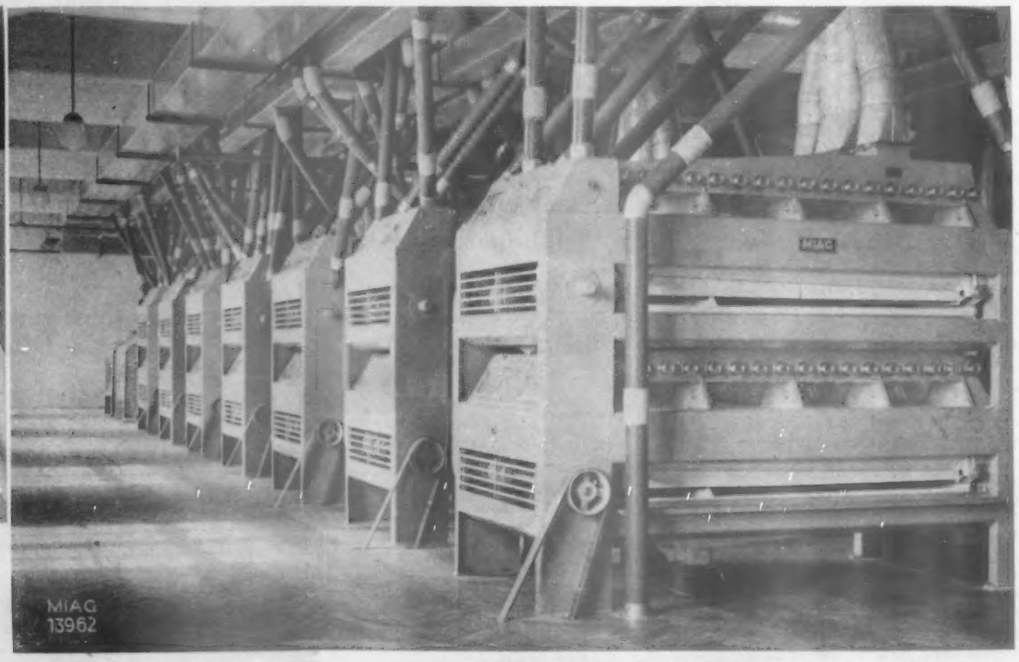

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the pros and cons of a grain sanitation program. Several methods of detection are now available, such as the cracking and flotation process, the stain technique, and the X-ray photograph. All of these require considerable time and trained technicians, however, and apparently do not fill the need.

Three approaches to the separating of infested from non-infested grain are under study at the Manhattan station, but it should be emphasized that these have not gone beyond the stage of demonstrating that such a separation can be made. None has been simplified to the point where it is ready for use by the grain handler. In each instance the method must yet be incorporated into a gadget that is practically self-operating. These methods are described at this time to show the possible attacks that can be made to solve the detection problem.

One approach is a simplified visual method, using polaroid lenses and an intense light beam. A sample of wheat kernels is placed between two polaroid lenses and the light beam directed through it. By rotating the lenses so that the deepest shade of blue is observed around the edges of the kernels, the shadows formed by the light rays showing through the kernels bring immature insect forms inside them to maximum definition. Although there is not as much visual detail as in the radiographic method, all stages of infestation can be detected.

The second approach is the detection of internal infestation by an electronic device. It has been found that the infra-red radiation produced by the metabolism of insect larvae or pupae within kernels of wheat can be picked up by a neon light relaxation oscillator. But this process will not reveal the presence of dead insects within the grain. Attemps are now being made to develop a sensitive instrument that will select individual infested kernels in a sample.

The third approach is a rather comprehensive study of the flotation method, in which some very interesting facts have been demonstrated. Flotation, wherein the goal is to submerge a sample in a liquid and float off all the kernels containing internal infestation, has never given clear-cut results. Advanced stages of infestation are fairly easily separated, but the early stages have not changed the kernel weight sufficiently to cause it to float. The picture is further confused in that lightweight sound kernels also float.

In the current experiments it was found that the specific gravity of a solution containing certain chemicals could be set at a point where all kernels that floated were infested, but some infested ones still remain submerged. As the specific gravity was increased step by step, the number of infested kernels remaining submerged decreased until a point was reached where all infested ones floated. As this point was approached some light-weight sound kernels also appeared in the fraction that floated.

The following results show the effect of increasing the specific gravity of the solution using samples of No. 2 hard red winter wheat of 12% moisture content. The percentage of internal infestation in each fraction of the samples was determined by radiographs.

Specific gravity of solution	Per cent of floating kernels infested	Per cent of immersed kernels infested
1.050	100	9
1.100	100	10
1.150	100	6
1.200	100	6
1.250	87	3
1.300	70	1
1.350	44	0

When the solution contained two nonmiscible chemicals of different specific gravities a three-layer separation resulted. A combination of specific gravities was found that floated practically all infested kernels in one or the other of the two floating layers, yet kept practically all lightweight sound kernels out of the top one. The kernels in the top layer were in advanced stages of infestation. The early stages of infestation appeared in the second layer. This separation was obtained with wheat of various moisture contents and of various test weights. With the specific gravity of the lighter chemical set at 1.160 and of the heavier at 1.300, the following results were obtained with No. 2 hard red winter wheat.

Test weight	Moisture content	% of infested kernels in Top layer	2nd layer	Bottom layer
58	10	100	21	2
	12	97	20	2
	14	100	15	2
58	10	87	20	0.2
	12	100	12	1
	14	100	7	4
60	10	100	28	2
	12	100	33	4
	14	100	4	1
62	10	100	31	3
	12	100	66	0.5
	14	100	62	3

Studies are now under way to see if a satisfactory flotation method for rapid detection of hidden infestation can be evolved from the results of the above studies.

Removal of Infested Kernels

A point of concern to the milling industry and the Food and Drug Administration is the fact that wheat kernels internally infested cannot be separated to any great degree by the cleaning processes used prior to milling. Such kernels are an important source of insect fragments in flour.

Attention should be directed, therefore, to the fact that a flotation process using a solution with a carefully controlled specific gravity may

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be a possible means of removing infested kernels from wheat stocks. It might be a means whereby the sound wheat in stocks known to contain a considerable amount of infestation could be salvaged and milled into fragment-free flour. This would eliminate diversion of the whole lot to non-food uses because of the condition of only a small fraction of the lot. This point has long been advocated by Dr. R. T. Cotton in meetings of the Association of Operative Millers' Sanitation Committee.

The experimental studies have demonstrated that with solutions having certain specific gravities, all of the infested kernels plus some lightweight sound kernels can be removed from wheat by flotation. The studies also indicate that it would be possible to adjust the specific gravity of the solution to the test weight or other factors of each lot of wheat so that the most accurate separation could be made. Since very little milling wheat is washed, this may be an impractical approach, but it should be called to the attention of the millers and the engineers designing milling machinery for their consideration.

Fumigation of Bulk Grain

Not many years back, the goal in the fumigation of grain was to kill all adult insects present. This was partly due to the fact that a notation on an official grade certificate that the grain was of the special grade "weevily," was based on the presence of live insects. The fact that it is not easy to determine the mortality of larval forms within the kernels may have been another factor.

In current practice it is important to kill the eggs, larvae, and pupae of weevils, Angoumois grain moth, or other species internally infesting the grain before much development of the insect occurs, for these are the forms, out of all the complex of stored-grain insects, that are the source of much of the insect fragment count in flour. It has been indicated that the normal dosage rates of common liquid-type grain fumigants would have to be approximately doubled to attain complete kill of all forms.

In studies to improve the efficiency of fumigation, attention was focused on adapting the recirculation method of application to the fumigation of large bulks of grain. Methyl bromide was selected for the first studies because of a knowledge of its efficiency in fumigation of other commodities.

Methyl bromide has never been very useful as a grain fumigant, since it will not penetrate very far into grain when applied to the surface, although experimental work has demonstrated that when diluted about 1 to 9 with carbon tetrachloride or the standard 75-25 or 80-20 mixtures, it will penetrate very well, but it has not been widely used in this manner.

On the other hand, methyl bromide has proved extremely successful when applied by the recirculation method, in which air drawn from the floor area of the bin, freight car, or storage tank is returned through a gas-tight duct to the head space above the load. When methyl bromide is introduced into such a recirculation cycle, it is drawn through the grain mass and distributed in an even manner. When the fumigation period is ended the gas can be removed from the grain by the same system through a discharge vent.

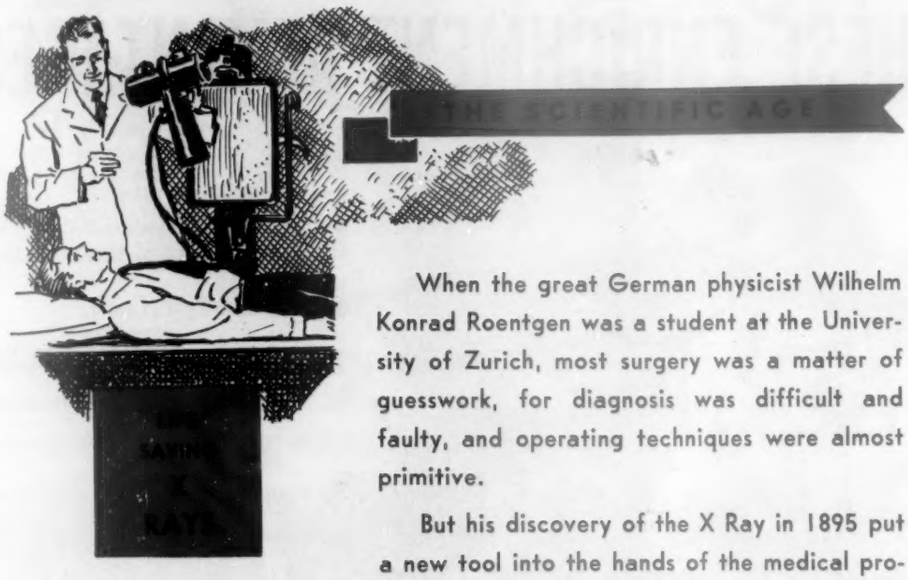
Not many opportunities have been available to study this method under practical conditions. It was adapted to the fumigation of cottonseed in large steel tanks holding from 550 to 3,000 tons of seed as reported by Phillips et al. It was likewise used in the fumigation of sorghum grain stored in surplus oil tanks as reported by Cotton and Walkden.

When the Commodity Credit Corporation stored wheat in surplus Liberty ships in the Hudson and James Rivers in 1953, grain aeration systems were installed in each hold. Permission was obtained to conduct experimental fumigations on these ships, and to alter the aeration systems in selected holds sufficiently to set up a recirculation system. Satisfactory distribution of methyl bromide was obtained in four tests. The bulks of wheat totaled 23,500, 42,000, 41,100 and 40,580 bu., respectively. The air flow rates in these holds ranged from 0.024 to 0.043 c.f.m./bushel. The gas was readily removed when the aeration system was restored to its original state.

Other tests were made in a commercial grain elevator, where a temporary recirculation system was installed. The system consisted of a perforated pipe placed across the middle of the unloading hopper as an air pickup source, a 30-inch blower, a flexible-tubing duct up the outside of the 135-foot tank, and a damper arrangement to regulate the air flow rate where the duct re-entered the tank through the manhole in the headhouse.

In three tests with a load of shelled corn, satisfactory distribution of methyl bromide was obtained with each of three different air flow rates within the range usually used for grain aeration, 0.0201, 0.0245, and 0.0317 c.f.m./bushel. Gas samples were withdrawn from the bottom, top and 15-, 35-, 55-, 75-, 95- and 115-foot levels to study the distribution. The gas was removed from the grain within a few hours after each fumigation by diverting the air flow to the outside.

Tests now being made indicate that the standard liquid fumigant mixtures can also be distributed satisfactorily by recirculation, with a pos-



When the great German physicist Wilhelm Konrad Roentgen was a student at the University of Zurich, most surgery was a matter of guesswork, for diagnosis was difficult and faulty, and operating techniques were almost primitive.

But his discovery of the X Ray in 1895 put a new tool into the hands of the medical profession and made possible many of the miracles of surgery and healing we see today.

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sibility of more rapid action and lower application rates.

These tests open up several interesting possibilities:

1. Dual-purpose aeration - recirculation systems will be feasible, where one installation can be used both for grain aeration and cooling, and for recirculation of fumigants.

2. A very high degree of insect kill can be expected because of uniform distribution of the fumigant throughout the grain mass, and there is the possibility of using more volatile fumigants which will penetrate infested kernels more easily. This should permit spacing fumigations much further apart since reinfestation will take longer to reappear.

3. The cost of fumigation will be materially lowered. It is indicated that the dosage rate for methyl bromide will be 2 lb. or less per 1,000 cu. ft. (about 800 bu. wheat), and for other fumigants will be much lower than with present methods.

4. The safety factor will be increased. The whole process will be conducted in a closed system where the fumigant is applied by opening a valve, and at completion all gas is removed from the grain before the storage structure is opened.

5. The fumigation period will be shortened to 24 hours, and the whole procedure including aeration following fumigation should be completed within 30 hours.

The Khapra Beetle

A new stored-grain insect, which is going to be harder to control than those we now have, has obtained a substantial foothold in this country. This pest is known as the Kharpa beetle, a native of India, Ceylon, and Malaya, which has spread to Japan, the Philippines, Australia, Africa, Europe and England. It belongs to the insect family Dermestidae, and is related to our common carpet beetles, and to Trogoderma versicolor, a particularly bad pest in non-fat dry milk solids. The Kharpa beetle will be principally a pest of storage structures in this country, but once it is established in a feed or seed warehouse, or a feed or flour mill, it is going to be difficult to root out. It has been found in a number of warehouses and mills in Southern California, Arizona and New Mexico.

A sub-station of the Manhattan Stored-Grain Insects Laboratory has been opened at Mesa, Ariz., to cooperate with Arizona, California, and other Western States in studies on this insect.

Protective Dusts or Sprays

The shift in emphasis to the prevention of insect infestation in stored grain has stimulated studies on the direct application of insecticides to grain when it is placed in storage. The usefulness of abrasive dusts such as magnesium oxide, made from mineral sources, has long been known, but such dusts give grain a gritty feeling and cause downgrading. With the advent of many new insecticides with long-lasting qualities, it appeared possible that some might be adapted to prevention of insect infestation.

This problem is very complex. Not only must the effective dosage rates for various formulations be established for various grains and under various regional conditions, but it must be determined whether or not any health hazard exists to the animals or humans who consume products made from grain so treated. Up until the present only those insecticides could be used that either broke down or dissipated during the normal storage period, or were removed in the milling process, since the Food, Drug and Cosmetic Act did not permit any insecticide to be present in a food product. Under these circumstances only one insecticide, pyrethrum, has been approved to date for use as a protective dust on grain. However, under the Miller Bill, grains are classed as raw agricultural commodities, and it is permissible to use insecticides, where necessary, on such commodities within prescribed tolerance limits. The Miller Bill sets up the machinery by which tolerances can be established.

A number of other insecticides are under study to determine whether or not they might be used as protective sprays or dusts. Some of these are less expensive than pyrethrum; some last longer. They have been selected because they are so highly effective against insects that only minute amounts which might fall within a low tolerance limit, are necessary, or because of their characteristic of being relatively non-toxic to warm-blooded animals at slightly higher dosage rates.

The results obtained to date indicate exciting possibilities in preventing insect infestation in stored grain, particularly under farm-storage and CCC-storage conditions. One formulation applied to farm-stored wheat at harvest in 1952 kept the wheat virtually insect-free over a period of 20 months until the bins were emptied in January, 1954. Other formulations applied to CCC-owned corn in September, 1952, held infestation to a very low level all through 1953. Approximately two hundred 3,000-bu. bins of corn and wheat have been treated and are being sampled each month to determine the level of insect population. Many of these are going through their second season since treatment.

Most of the bins of grain were treated as they were filled or transferred, by direct application of the dusts or sprays to the grain as it passed through a conveyor. Some loaded bins with aeration systems were treated by drawing an aerosol through the grain while operating the

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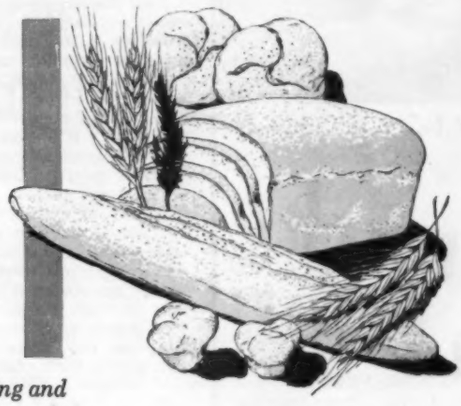
FLOUR FOR MAN'S BREAD*



A Brief History of Milling and Baking by SCIENCE WRITER

CHAPTER VIII. *European Millwrights*

LEARNING BY DOING

The early European millwrights were great travelers. This was necessary because they were obliged to go where work offered. When they completed one job they moved on to the next. These men used their skills to design and then build the mills.

They learned by doing—and they taught as they traveled. Their knowledge was not recorded in books because they could neither read nor write. Still they taught. What they observed they passed on through maxims and by instructions to their apprentices.

Even with little knowledge of the forces involved they built mills that worked. They may not have known *why* they worked; they knew only that they *did* work. These untutored millwrights served a valuable function by creating mills and improving the milling process. Man had long since learned that he could not eat wheatberries—that he *must* put grain through a mill to remove the rough, coarse bran particles and leave only the more desirable, edible portion.

Sir Isaac Newton

SCIENCE ENTERS

As knowledge increased so did rational thinking. Traditional ways were examined and better ways evolved. Mathematics, long an abstract science, became a working tool. Measurements, proportions, calculations, ratios were developed into formulas which governed the millwrights' work.

During the time that the mechanical skills were growing, other men of a different character were working to discover the scientific principles behind many mechanical devices. In the sixteenth century much work in practical mechanics was followed in the seventeenth by study in physical theory.

SCIENCE AND MECHANICS JOIN FORCES

Gradually science and mechanics grew closer together to their mutual benefit. The practical men, the millwrights, did not immediately accept the idea that scientific thought could be helpful. One, an Englishman, wrote in 1818: "Machines or engines seldom owe their origin or improvement to consideration deduced from laws of motion. It is from long experience, and repeated trials, errors, deliberations, corrections, etc., continued throughout the lives of individuals, and by successive generations of them, that the practical sciences derive their gradual advancement from awkward beginnings to their most perfect state of excellence."

A different attitude was taken by another Englishman at about the same time who acknowledged that those skilled in science often lacked practical knowledge but said that the reverse was also true. Even so, the practical man—the millwright—and the theoretician did eventually form an alliance.

A NEW SOCIETY IS FORMED

Practical and theoretical knowledge increased. Mills grew in size. Production became greater. Wider markets were served. And a business society evolved. Along the way the artisan millwright disappeared for a good reason. As the mills became larger and more complex, investment became heavy. Too much was involved to be trusted to simple rule-of-thumb methods. More and more the practical man became guided by the findings of the scientist.

SCIENCE AND NUTRITION

The growth of scientific principles over the centuries led to the searching examination of thousands of nature's secrets. Within the last 50 years or so, many facts about one of our most vital substances, food, have been learned. Vitamins were discovered, analyzed, classified, isolated and finally, duplicated. We all benefit from this knowledge because practically all of our white bread and white flour is enriched with thiamine (vitamin B_1), riboflavin (vitamin B_2), niacin (another "B" vitamin), and the mineral iron to correct losses of these elements which occur when wheat is milled to give us the fine white flour we want. America's bakers and millers have used science to give us more healthful products.

This is one of a series of articles which is being published in professional nutrition and dietetic journals, and which will be widely distributed for educational purposes. Reprints of this and all previous chapters are available without charge. Write to the Vitamin Division, Hoffmann-La Roche Inc., Nutley 10, New Jersey. In Canada: Hoffmann-La Roche Ltd., 286 St. Paul Street, West; Montreal, Quebec.

The next chapter titled: "Milling in the Early American Colonies" will be published soon.

*This is the title of a definitive history of milling by John Storck and Walter Dorwin Teague, published by the University of Minnesota Press at Minneapolis and copyrighted by the University of Minnesota. It is used with permission as a source of material for this series of advertisements.

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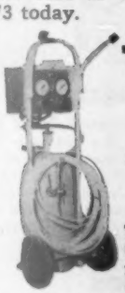

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system. The insecticide was deposited on the grain at all levels in the bins by this method.

Other Recent Developments

In addition to the studies mentioned, many others are under way which are of interest in the consideration of grain sanitation.

Exploratory tests are being made to evaluate electrical energy treatments for stored-grain insect control. These include studies on the use of high-frequency radio waves, cathode-ray irradiation, and gamma-ray irradiation. None of these processes seems to be practical for the treatment of large bulks of grain under present conditions. The Manhattan station plans to keep abreast of new developments in this field.

Two Kansas flour mills held their insect populations to a reasonably low level for a 16-month test period by monthly vacuum cleaning of the plant, supplemented by spot fumigation of inaccessible milling units. This was a joint study between the mills and the Manhattan station.

New insecticides are evaluated as to their possible use for controling stored-grain insects, in a screening program at Manhattan. Promising candidate materials are then tested under field conditions.

A group of cooperating country elevators are observed at regular intervals to study the fluctuations in insect populations, sources of infestation, and the degree of effectiveness obtained in their control programs.

——BREAD IS THE STAFF OF LIFE——

General Mills Plant Earns Safety Award

MINNEAPOLIS — The National Safety Council has announced that the General Mills, Inc., Purity Oats Mill in Minneapolis has earned the NSC safety award for its outstanding safety record.

Ned H. Dearborn, president of the National Safety Council, in a letter to M. L. Olson, plant superintendent, congratulated the employees for their record of over a year (237,758 man hours by the end of 1954) without a lost-time accident.

The safety award is given only where an establishment's record satisfies rigid requirements laid down in the council's award plan for recognizing good industrial safety records. The plant won similar awards in 1949 and 1950. R. W. Smith is the plant's safety director.

Recently, General Mills' employees at the plant received individual prizes for winning the intra-company safety contest last year. At that time, each employee had his choice of such items as alarm clocks, steak knife sets, card tables, trouble lights and cigarette lighters.

——BREAD IS THE STAFF OF LIFE——

Smut Resistant Wheat Variety to Be Released By West Coast Stations

PULLMAN, WASH.—Another new wheat variety, unnamed as yet, will be released this fall, announces Dr. Mark T. Buchanan, Washington State College research director. It will be released jointly by the Washington college, Oregon State College and Idaho experiment stations.

The new variety, a soft white winter wheat slated to replace Elmar, is a red-chaffed club. A near relative of Elmar, the new variety combines Elmar's good qualities with stronger smut resistance. The red chaff will make it easy to distinguish the new variety from otherwise similar club wheats, especially Elgin, Alicel and Elmar, it is claimed.

Yield of the new hybrid appears to be at least equal to that of Elmar. The straw is medium short which normally means a range of between 3- and 3½-ft. in the main club wheat areas. This also means the straw is short enough to resist lodging under most growing conditions. Weather conditions have not permitted a good differential test of winter-hardiness but breeders expect it to be at least as resistant as Elmar to winterkill.

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SPECIFY WESTERN-APPLIED
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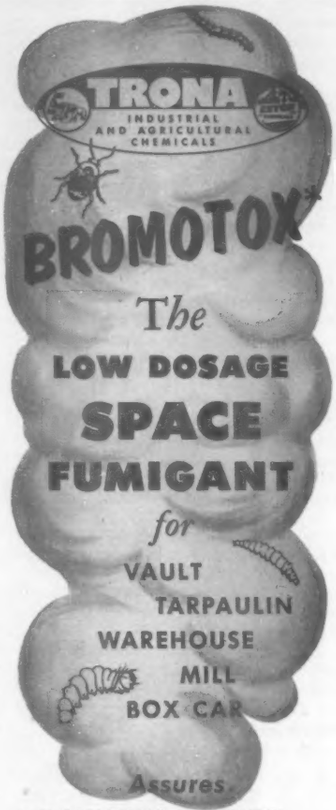

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- *MORE ECONOMY*

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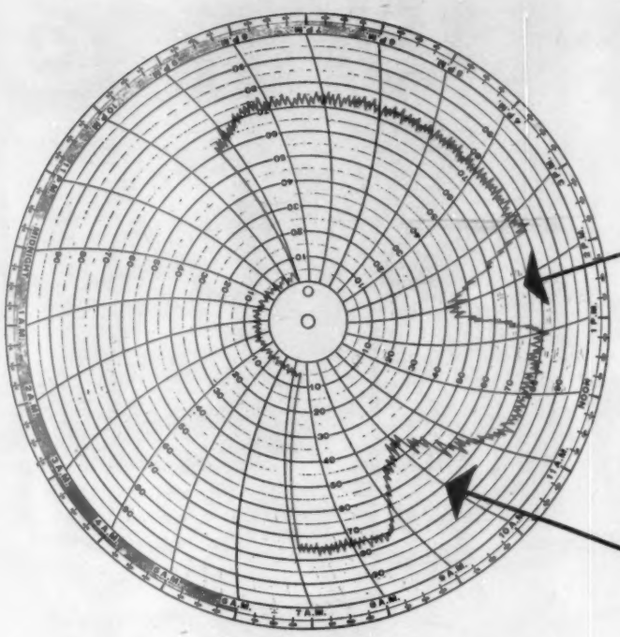

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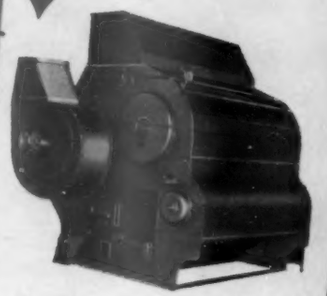

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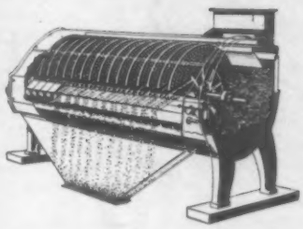
A ♥

K ♥



CARTER DISC SEPARATOR
Length Separation

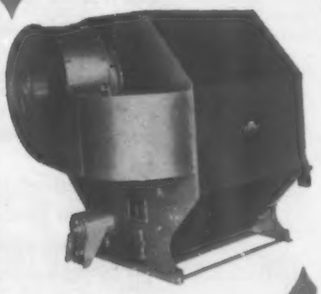
K ♥

Q ♥

CARTER MILLERATOR
Screening and Aspirating

Q ♥

J ♥



CARTER DUO-ASPIRATOR
Accurate Aspiration

J ♥

10 ♥

CARTER PRECISION GRADER
Width or Thickness Separation

10 ♥

"A good extra card to have up your sleeve"

2 ♥

CARTER DOCKAGE TESTER

2 ♥

HART-CARTER
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